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A Study on Turkish Highways

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A STUDY ON TURKISH HIGHWAYS

By

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This thesis is approved as a creditable, independent investigation by a candidate for the degree, Master of Science, and acceptable as meeting the thesis requirements for this degree; but without implying that the conclusions reached by the candidate are necessarily the conclusions of the major department.

A C K N O W L E D G E M E N T

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INTRODUCTION

Turkey is so placed geographically that it forms a natural bridge between Europe and Asia, which not only served the armies of old times in their campaigns, but also opened up the historic trade routes between these two continents. After the reign of Alexander the Great and up to the time of the Crusades, owing to the traditional road policy of the Romans, a dense network of roads was established in Anatolia. These roads, which greatly increased the wealth of Asia Minor, were specially planned to fulfill both military and commercial requirements and to provide a means of communication. Certain of them, such as the Silk Road, the Spice Road and the Royal Road (8), were recorded as main commercial arteries. In the time of the Seljuk Turks and the Ottoman Empire, the majority of the roads were built for the purpose of the major military campaigns. Later, the discovery of the ocean route via the Cape of Good Hope caused the old caravan routes to be neglected; and consequently, the roads of Turkey were allowed to deteriorate.

With the development of express highways and modern commercial vehicles, Turkey has now entered an era

in which road transport is again in a position to compete even with sea transportation. Turkey, therefore, will play once again an important part internationally and this fact has been taken into account in the present planning of her national highways, for they will also serve as international traffic arteries.

The following pages present Turkish highway policy with its complete details in this new highway era and criticise it from administrative, technical and economical points of view.

CHAPTER I

HIGHWAY ADMINISTRATION, FINANCE AND PERSONNEL STUDIES

Turkey's road history goes hundreds of years back to the times of the Roman Empire. But her highway policy with its modern meaning begins only a few decades ago. The "Traffic Tax" law (10), which passed the parliament in 1921, may be considered as Turkey's first highway law with modern highway principles. This law divided the roads of Turkey into two categories, namely "General Roads and Private Roads" (10). General Roads were tho equivalent of today's National highways and private roads equivalent of the secondary roads. After this law, the construction of some roads was planned and granted. In 1925, a law with the name of "Road Contribution" (10) was accepted by the Parliament, and it was agreed that all the tax collected with this law would be used for road construction and maintenance. But in 1927, just two years later, a new law put the highway administration and finance under the jurisdiction of provinces, and this mistake paralized the road programs completely. Fortunately, the mistake was comprehended very soon, and a new law was granted whereby a "Department of Roads and Bridges" (8, 10)

was established and the new department took the highway administration in 1929. According to this new law, a National Highway system was established, and the roads of the provinces were taken under the jurisdiction of Public Work Directorates of provinces. Also, 50% of the road tax was set aside for National roads and 50% for provincial roads with the new highway law (8, 10). Each province has undertaken the duty of preparing a three years highway program. A National highway system of 3594 kilometers (10) was planned by the Department of Roads and Bridges immediately. But, unfortunately, in 1931, the economic difficulties of those years forced the government to transfer 85 per cent of the road tax to the other vital purposes with a new law (8, 10). The remaining 15 per cent was not enough in any way for the development of highways. This condition continued until the beginning of the Second World War. The national defense and security problems showed that Turkey was in need of a good highway system and an intensive effort began to provide it. In 1947, using 5 million dollars of the American Economic Aid, highway machinery was bought for the improvement and maintenance of the roads (10). In 1950, with a new highway law, General Directorate of Highways (8, 10, 11) was established and a new era in the history of Turkish highways was begun.

These long and from time to time very harmful experiences, which are briefly explained in the previous paragraph, show very clearly that the administration and finance are two extremely important parts in the highway problem.

A. Highway Administration

The organization of the road administration body of Turkey began with the establishment of a General Directorate of Roads and Communications in 1860 (8). This directorate existed until Turkey declared herself a republic in 1923. In 1929 legislation was passed whereby a Department of Roads and Bridges (8, 10) was set up within the Ministry of Public Works. After the Second World War, in 1947, works for a new development on the Highway organization began. As the first step for this purpose, highway legislations and the highway organizations of some 16 countries were studied. Much use was also made of a comprehensive report on the highway situation in Turkey prepared by Mr. H. E. Hilts of the Bureau of Public Roads of the United States of America. As the result of these works, a bill was drafted whereby a General Directorate of Highways (8, 10, 11) was created in 1950 to replace the Department of Roads and Bridges in the Ministry of Public Works. The new Directorate is a semi-autonomous government organization.

The functions of the General Directorate of Highways are as follows:

1. To select and designate the roads and bridges to be included within the State Highway system, to determine or modify the locations thereof, to construct, improve and repair the same in accordance with the designs that the General Directorate shall prepare, to maintain them, and to insure their safe usage.

2. To review and supervise the programs of the construction and to submit them to the Minister of Public Works for approval.

3. To establish technical bases, standards, and procedures for the construction, betterment, maintenance and all other matters for all highway system.

4. To select, store, repair and keep in operating condition the materials, equipment, tools and vehicles necessary for road construction and maintenance and to establish necessary repair-shops and installations.

5. To occupy temporarily, expropriate or buy according to law any real property necessary for the proper functioning of the General Directorate of Highways.

6. To construct or rent, equip and maintain the garages, shops, warehouses, store-houses, office buildings, service and fuel stations necessary for the construction, improvement, maintenance and safe operation of the State Highways and all other installations which are necessary for the efficient functioning of the General Directorate of Highways.

7. To establish and make effective regulations, bases and principles for the use and preservation of the roads and to install necessary road signs.

8. To collect and publish information about the Works of the General Directorate of Highways.

9. To do all other work related to highway systems.

The General Directorate of Highways is composed of a Central Organization and a Field Organization (11) (figure 1). The General Director of Highways and the Assistant General Director administer both the Central and Field Organizations. The Central Organization has a solicitor, a chief accountant and the following three main departments: (11)

1. Department of Administrative Affairs
2. Department of Technical and Economic Research
3. Department of Construction and Maintenance.

These Departments are again divided into several divisions. These divisions and their functions are as follows:

1. Department of Administrative Affairs

a. Personnel Division:
The functions of the Personnel Division are to employ necessary personnel for all the parts of the Highway Organization, to provide good personnel Department relationships and to make arrangements for the training of the personnel.

b. Procurement Division:
This division supplies all the material and equipment needs and also provides necessary buildings such as garages, shops, warehouses, offices, service and fuel stations for the whole Highway Organization. Also it is responsible for providing necessary foreign exchange for the supplies needed.

c. Registry Division:
This division is the bookkeeper of the organization. It is responsible for the registration of all the properties and the expenditures of the Highway Organization.

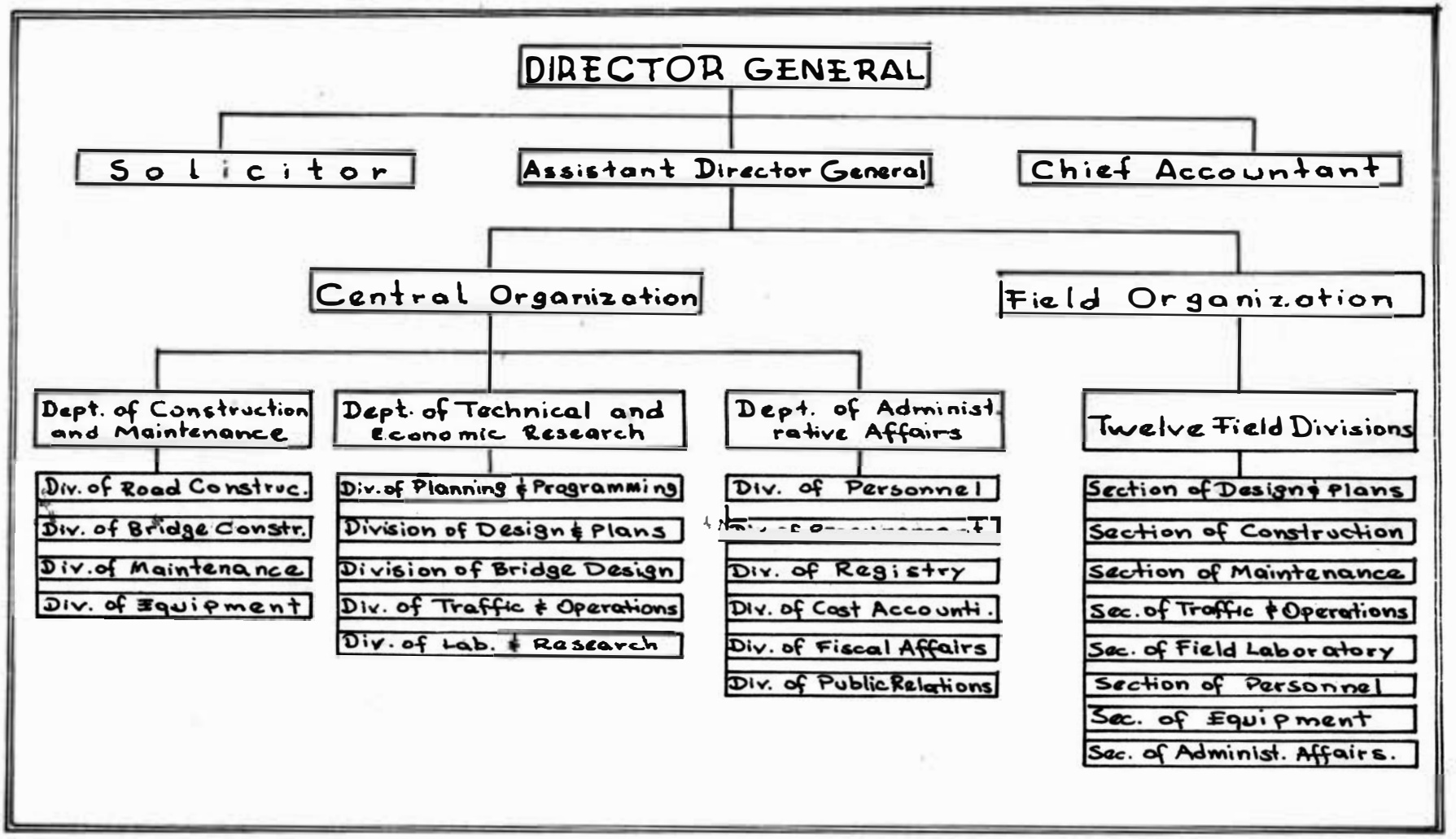

Figure 1.

GENERAL DIRECTORATE OF HIGHWAYS ORGANIZATION CHART

d. Cost Accounting Division
This division makes the estimations and final calculations for the cost of the proposed projects and also for all the other expenditures of the organization.

e. Fiscal Division
This division together with the Cost Accounting Division estimates the expenditures for the next fiscal year and submits the proposed budget of the General Directorate of Highways to the Ministry of Public Works. In this proposed budget, all the expenditures for all kinds of activities of the Organization should be shown in itemized form.

f. Public Relations Division
This division is responsible for occupying temporarily, expropriating or buying according to law any real property necessary for the proper functioning of the General Directorate of Highways. The requests and complaints done by the public are also taken care by this division through its Requests and Complaints Bureau.

2. Department of Technical and Economic Research

a. Division of Planning and Programming
This division prepares short or long term highway programs and controls the application of these programs with continuous activity reports. To make traffic surveys in the cities and on the highways and to prepare traffic circulation maps are also among the functions of this division. The necessary road maps are to be prepared by this division. The Division also makes economical, financial and touristic studies concerning all the roads and highways and collects and publishes statistical information about the roads and bridges.

b. Division of Design and Plans
The functions of this division are to design the roads for the whole country and to prepare the necessary drawings.

c. Division of Traffic and Operation
This division together with the General Directorate of Public Security is responsible for the application of the traffic laws and regulations. Analyzing the traffic accidents, to make suggestions to the Construction and Maintenance Divisions, to the General Directorate of Public Security, and to the

administrators of the Provinces are also among the functions of the Division. Furthermore, the plans and projects prepared by the other divisions are controlled by this division for the traffic security and for easy operation. Another function of the Division is studying the traffic sign needs, to administer and control the manufacture of these signs.

d. Division of Laboratory and Research
This division makes all kinds of tests for the whole Highway Organization. Also it performs laboratory and field research to establish better technical bases, standards and procedures for the construction, betterment, maintenance and all other matters for all highway systems. A well-equipped testing laboratory, divided into three sections, is engaged in the study of soils, bituminous materials and cement, and the latest techniques in road construction. The Division has also a test road for experiments and research.

e. Division of Bridge Design
Justification of the location of the bridges and all kinds of bridge designs are provided by this division.

3. Department of Construction and Maintenance

a. Division of Road Construction
Its function is the administration of road constructions all over the country.

b. Division of Bridge Construction
Administration of the construction of the bridges is the function of the division.

c. Division of Maintenance
This division is responsible for the administration of maintenance work of all the field divisions.

d. Division of Equipment
The functions of this division are to select, store, repair and keep in operating condition the materials, equipment, tools and vehicles necessary for road construction and maintenance and to establish necessary rep ir shops and installations.

Field Organization of the General Directorate of Highways consists of 12 divisions, (11) each one covering

several provinces as its area of operation. These divisions are shown on map 1. The Field Divisions were organized and strategically placed around the country as follows:

1st Division.....Istanbul
2nd Division.....Izmir
3rd Division.....Konya
4th Division.....Ankara
5th Division.....Mersin
6th Division.....Kayseri
7th Division.....Samsun
8th Division.....Elazig
9th Division.....Diyarbakir
10th Division.....Trabzon
11th Division.....Van
12th Division.....Erzurum

Within each Division operate sections of

a. Design and Plan
b. Construction
c. Maintenance
d. Traffic and Operations
e. Field Laboratory
f. Equipment
g. Administrative Affairs and Personnel.

Field Divisions also have field districts and units, attending to maintenance of roads as well as of equipment within the limits of their area of operation. Each district has some 400-500 kilometers of roads to maintain. Sometimes, the districts are again subdivided into sections having about 100 kilometers of roads for maintaining.

In addition to those, a "Touristics Design and Planning Bureau" (4, 8) has been formed as part of the General Directorate of Highways for the purpose of

designing and building accommodations for tourists, including hotels, restaurants, filling stations, garages and so on. The main object of the Bureau is to study local conditions and to provide suitable accommodation and service at low cost.

The General Directorate of Highways is directed by and in charge of a General Director. The General Director is appointed, transferred and promoted upon the proposal of the Minister of Public Works and by the joint decision of the Council of Ministers. The Assistant Director-General, the Solicitor and the Department Heads are appointed upon the proposal of the General Director with the approval of the Minister of Public Works. The appointment, transfer and promotion of all other employees and officials are made by the decision of the General Director. The Chief Accountant and the personnel of his office are appointed by the Ministry of Finance. Each Field Division is headed by a Divisional Engineer who has a staff of seven assistants to operate the seven sections of the division.

All work on primary and secondary roads is to be carried out by the General Directorate of Highways through its Central and Field organizations, while village roads are to be supervised from a technical and advisory point of view only, by the Directorate. The actual construction work is to be carried out locally, and it is

planned to provide an engineer for each of the existing 450 counties.

B. Highway Finance

Road construction on a financially sound basis in Turkey was not materialized before the introduction of a road tax in 1929. In that date, legislation was passed whereby a road tax for the construction of roads and bridges was granted, and a Department of Roads and Bridges was set up. Two separate systems of National and Provincial highways were established and 50% of the road tax was set aside for National roads and 50% for Provincial Roads (8, 10). In 1931 due to financial difficulties the percentage of the road tax allocated to National roads was reduced to 15% and 50-70% of the allocation for the Provinces went to expenditures other than road work (8). Thus owing to the decrease in revenue and lack of good organization, the program in road construction was severely handicapped and could not meet the country's increasing transport needs. The new Highway Law, which came into effect on March 1, 1950, provides the Directorate of Highways with a steady and sure source of income derived from : (4, 8)

a. Custom duties and other taxes levied on various petroleum products.

b. 15% Road Tax which is a fixed per capita tax.

c. Direct appropriations from the Treasury to meet other highway expenditure.

d. Revenue collected from the sale of discarded equipment, materials, etc.

It is evident that, with the improvement of roads and the consequent increase in motor traffic, fuel consumption and highway revenue will also increase, thus enabling the Directorate of Highways to have more funds available each year for maintenance and construction works. The financing of the three systems of Turkish roads[1] is as follows (8):

Expenditure on the primary system will be met by revenue from taxes on petroleum products. It is estimated that this revenue is about 90-100 million Turkish Liras (8) or 32-36 million dollars[2]. The secondary system will be financed by an additional Treasury grant and the allocation of half of the road tax which yields some 15-18 million dollars (8). The remaining half of the road tax will be allocated to village roads.

The Turkish highway development program has received substantial support from the government which has given it top priority in the national budgetary

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[1]The three systems of roads of Turkey are primary system of trunk roads, secondary roads including existing provincial roads and the system of village roads. These systems will be fully explained in Chapter II.

[2]One American dollar is 2.83 Turkish Lira

allocations. Government spending for the development of highways in recent years has been as follows (11):

1948	12,000,000	Dollars
1950	19,000,000	"
1951	29,000,000	"
1952	63,000,000	"
1953	82,000,000	"
1954	68,000,000	"
1956	107,000,000	"
1957	134,000,000	"

Since 1948, Turkish expenditures for national highways have amounted to 420 million dollars (11) including construction, maintenance, and administration. Turkey will spend 177 million dollars for national highways in 1958, out of its 1,640 million dollars budget (15). This is nearly 15 times the amount of the 1948 highway budget when the United States inaugurated its aid to the road program. Since 1948, United States assistance has amounted to 40.3 million dollars (11, 15). With this aid Turkish highway expenditures amount to 460.3 million dollars since 1948. As an example, the National Highway expenditure for the year of 1957 is shown in Table 1 (10).

Table I. Highway Expenditure of Turkey in 1957, in Million Dollars

Field	Cash Million Dollars	Bond.
Highways		
Construction	28.40	13.00
Maintenance	13.90	3.87
Improvement	5.94	0.66
Expropriation	10.60	-
Bridges		
Construction	5.17	3.66
Maintenance	0.72	0.10
Establishments		
Construction	2.96	-
Other expenses	0.03	-
Highway Practices		
Programming	0.15	-
Road Planning and Projects	1.95	-
Bridge Planning and Projects	0.30	-
Research	0.30	-
Traffic Engineering	0.26	-
Equipment		
Purchases	4.15	-
Maintenance	10.78	1.33
Administration and Personnel	7.54	-
Depts. from 1956	1.89	-
Bond Payments	24.00	-
Total	118.73	22.52

C. Personnel Studies

It readily becomes apparent that the question of recruiting engineers, operators and mechanics on a large scale, and training them for the efficient functioning of the organization, is of paramount importance. Lack of experienced personnel, especially engineers, is one of the problems that the Highway Directorate is facing presently.

The number of the personnel in the Central Organization of the General Directorate of Highways is 588 (10). This amount includes 143 engineers, 12 technicians, 30 operators, 339 office clerks. The rest of the personnel work on different jobs (10). Three hundred ninety out of 487 male personnel have completed their military services and are working permanently (10). Of the total of 588, 210 are college graduates, 226 are high school graduates and the remaining 112 are grammar school graduates (10). Hundred twelve out of 143 engineers have Master's Degree (10). In the Field Organization, each of the twelve divisions has one head and seven assistant engineers. The number of the other personnel changes from time to time depending on the work which the division has at that particular time.

The highway personnel training has been taken into consideration very seriously since 1950. One of the methods used for the training of the personnel, especially

engineers, is to send them to other countries, with experienced backgrounds, for practical training. For this purpose, the first group of engineers was sent to the United States of America in 1950, for one year of practical training (10). The group consisted of 24 engineers in ten different Highway Engineering branches. Three of them worked on bridge construction, two on bridge design, one on highway planning and programming, four on highway design, five on highway maintenance, two on research, one on highway construction, one on highway economics and four on highway machinery (10). They worked for the Bureau of Public Roads, General Accountings, Bureau of the Budget, Civil Service Commission, General Service Administration Offices and in different states for the State Highway Departments. Upon the returning of the first group, a second one of 30 engineers was sent to the United States in 1952, for 9 months training (10). After these two groups, relatively small ones of 3 or 4 engineers are sent to the United States, Germany, Switzerland, Sweden and to many other European countries for their training in specific subjects such as photogrammetry and its applications to the highway work.

Another method used in Turkey for personnel training is to organize courses, lasting one week to eight weeks, on different subjects. This was begun with

an asphalt course (10) for the engineers of the field divisions in 1950. In 1951, soil, concrete and bituminous test courses, and a communication course (10) were added to the asphalt course. In 1952, language night-courses were established in order to make the reading of technical publication in other languages possible for the highway personnel. Finally a highway planning and programming course (10) was added to the courses mentioned above.

To begin the training of future personnel in school, after careful studies, new highway courses were added to the programs of the engineering schools and summer jobs were kept open for 150-200 engineering students every year in the organization of the General Directorate of Highways. Also, "Highway Machinery" was added as a completely new branch to the programs of the schools for technicians (10).

In addition to all these which are mentioned above, it was provided that every year the engineers and administrators of each branch of highway work would get together and try to share their new experimental knowledge, discussing various problems in their fields.

Requests have been made by various Middle East countries during the past few years to the United Nations Technical Assistance Administration for receiving training

in modern principles and practices of highway planning, design, construction and administration. The U.N. Technical Assistance Administration has investigated the problem, and as a result it has been concluded that the principles and methods presently applied by the Turkish General Directorate of Highways can meet the requests in a satisfactory manner. Subsequent investigations in 1954 with the Turkish General Directorate of Highways having met with approval, the United Nations Technical Assistance Administration prepared a budget to meet the expenses involved in the training Center (10). Finally the official proposal has been made for conducting a highway training center by the Turkish General Directorate of Highways for the highway personnel of the Middle-East countries. For this purpose, the necessary agreement was mutually approved by the Turkish Government and the United Nations Organization. In this way "The United Nations Highway Training Center of Ankara" (10) came into existence on August 26, 1954. As a result of the satisfactory experiment of the first year, the United Nations Technical Assistance Administration requested the training center to be organized and conducted again in 1955, 1956 and 1957 by the Turkish General Directorate of Highways. Engineers and administrators not only from Middle East countries but also from European and Far Eastern countries

attended the courses.

The courses, which lasted 3 months were planned as follows:

The program was divided into joint sessions, field trips and specialized studies. The specialized studies include the following six groups: (10)

1. Highway administration and planning
2. Road surveys and design
3. Materials research and design
4. Road and bridge construction
5. Road maintenance and bituminous surfacing
6. Equipment operations, repair and maintenance, and supply services.

The first two weeks were devoted to lectures on general principles of these topics, visits to headquarters shops, laboratories and design rooms. Specialized studies were conducted in separate groups for the participants interested in the subjects taken up in those groups, for six and a half weeks, during which the participants worked at the headquarters and in the field on various projects. The following two weeks were devoted to a field trip to various road construction projects in which all the participants joined. Three days were devoted to a seminar which was joined by all the participants and the training staff. This provided an opportunity for an informal round-table discussion of questions and problems that had been taken up during the training period. During the last week of the program the participants prepared and submitted their reports.

CHAPTER II

TURKISH HIGHWAYS AND BRIDGES

Turkey has an area of 296,503 sq. miles; of which 96.88 per cent lies in Asia and the remaining 3.12 per cent in Europe (4). The Anatolian Peninsula, which separates the Black Sea from the Mediterranean, is the heartland of Turkey. Add to it the most eastern corner of Thrace, and the northern watersheds of the Euphrates and Tigris Rivers, and the shape of Turkey emerges. The country stretches 948 miles from east to west along the 40th parallel and 395 miles from north to south along the 33rd longitude, its widest part (14). Superimposed upon the United States, Turkey would fit neatly between Washington D.C. and Kansas City, Missouri (14). The Turkish capital, Ankara, lies on the same parallel, 40 degree north, as Philadelphia and Denver.

Other than the low, rolling hills of Turkish Thrace, the fertile river valleys that open to the Aegean Sea, the warm plains of Southern Anatolia, and the narrow littoral along the Black Sea, the country is wrinkled by rugged mountain ranges that surround and intersect the high Anatolian plateau. Average

elevations range from 2,000 feet above sea level in the west to 6,000 feet amid the wild eastern high lands (14). There are 113 peaks with an elevation of 10,000 feet or more (14).

Owing to this topography, road construction presents a difficult problem in Turkey.

A. Road Development in Turkey

Road construction in Turkey dates back to pre-Roman times and the remains of certain of these roads can still be seen throughout Turkey.

In 1860, with the establishment of a "General Directorate of Roads and Communications" (8), a plan for road construction was worked out, but never completed; and it was only through the initiative of certain governors that disconnected stretches of roads were built in various provinces of European and Asiatic Turkey. In 1908, the construction of certain major roads was entrusted to a French firm of contractors but, owing to the Balkan War and World War I, work was discontinued (8). In 1929, legislation was passed whereby a "Department of Roads and Bridges" (8, 10) was set up, two separate systems of National and provincial highways were established, and road construction was materialized on a financially sound basis. But, due to the economic troubles of those years, revenues for road work were decreased 85 per cent

and progress in road construction was severely handicaped by this cut (8). As late as 1945, Turkey had no national highway system. The majority of the provinces and regions were not connected by a main road system, and there were impossible stretches making road travel either impossible or hazardous. The total lengths of the various highways at that date were as follows: (8)

Asphalt surfaced	515 miles
Macadam (the majority in need of widening, realignment or repair)	11,750 "
Earth roads and tracks	14,950 "
Total.....	27,215 miles

During World War II, communications by rail and sea could not meet the increased passenger and other transportation demands, and an adequate system of trunk and feeder roads, both for military and economic purposes, was urgently needed. This resulted in the improvement and construction of certain roads in the Western and Southern regions of the country. In 1947, due to the friendly cooperation of Commissioner Thomas H. Mac Donald (10), a mission from the U.S. Bureau of Public Roads, headed by Mr. H. E. Hilts (8, 10), deputy commissioner, was sent to Turkey to act in an advisorycapacity to the department. A plan for a national highway net-work of approximately 23,000 kilometers was worked out in 1948 and this was scheduled to be completed within nine years.

At the beginning of the program, in 1948, all-weather main roads totaled 5,680 miles (11), only 580 miles (11) of which had bituminous or other high-type surface. In 1950, the establishment of "General Directorate of Highways" (8, 10, 11) as a semi-autonomous organization and the new Highway Law that provided a steady and sure source of income for the organization, made the highway activities gain a new speed which has been increasing every year since then. The position at the end of 1950 showed the following lengths of road in existence: (8).

Asphalt	990 miles
Macadam and gravel stabilized (improved)	8,470 miles
Roads in need of improvement	4,550 miles
Earth roads and tracks	14,050 miles
Total	28,060 miles

The 1948 road plan, which envisaged the construction and improvement of 23,000 kilometers of state highways, was far below the needs of the country, and in order adequately to meet the road transportation needs of Turkey, it was proposed in 1951 to draw up an over-all highway programme, including primary, secondary and village road systems. After careful study of the existing road system, traffic flow, and estimated future needs, it was decided that a solution could be achieved by

establishing three systems of roads: (8)

1. A primary system of trunk roads of some 20,000 kms. (12,500 miles) in length.

2. A system of secondary roads, which would include also the existing provincial roads, and which was estimated to be 30,000 kilometers (18,800 miles).

3. A system of village roads, amounting to 150,000 kilometers (93,800 miles), to be built in three stages of 50,000 kilometers each.

On the application of this program the principle of stage construction was adopted, by which each section of roadway was built and improved to meet present and future traffic needs. Surfacing materials, varying from gravel to different types of asphalt, were applied to withstand the increased volume of traffic. Traffic counts, which were being carried out seasonally, were the basis for checking traffic trends. It is apparent that the adoption of such a system allows for the construction, improvement and maintenance of a maximum length of roads with a minimum expenditure.

With the application of this program, the length of primary system roads reached to 11,800 miles in 1955 (10), with an increase of 107 per cent (10) over 1948. The increase is 6100 miles (10) of which 3125 miles (10) are new construction and the remaining is the

improvement of the existent roads. The length of asphalt and other high-type roads reached to 1595 miles (10) with an increase of 156 per cent over 1948 (10). The highway net-work of the primary system now aggregates 15,350 miles (10). All-weather roads in Turkey have increased to 11,900 miles, 3340 miles of which are now roads built to modern standards in the past nine years (10). Of these, 2170 miles are bituminous surfaced or paved (10). A total of 13,600 miles (10) is maintained. On the other hand, work on the secondary and village road systems was very slow until 1953. In 1952, total length of secondary roads was 16,900 miles of which 1875 miles were macadam roads in good condition, another 1875 miles were macadam roads in need of improvement and the rest was earth roads (10). Between 1953 and 1956, 2910 miles of secondary roads were constructed and 3660 miles were improved (10). In the village roads system, 12,500 miles of roads were graded (10).

The use of machine power didn't come into the snow removal work until 1948, and the total length of highways, kept open to the traffic all through the year, was very small. Since 1948 (10), purchase of enough machinery solved the snow removal problem almost completely. The increase in the length of highways which are kept open to traffic the entire year is as follows: (10).

1949	6,075 miles
1950	7,975 "
1951	9,950 "
1952	10,200 "
1953	10,550 "
1954	10,950 "

The roads to be cleared of snow during 1957 winter, are shown on map 2.

At the end of 1954, the use of snow fences amounted to 674,000 feet. (10).

B. Bridge Construction

Turkey entered the Republican era, in 1923, with 283 wooden and 102 steel bridges (10). In 1924, bridge construction began with a rate of two big bridges per year and gained more and more speed year after year. Between 1924 and 1947, in 24 years, 166 big bridges (10) with total length of 36,000 feet (10) were built. In 1948, together with the new highway plan, bridge construction had its full speed. In five years, between 1948-1952, 298 bridges with 60,000 feet in total length were construction (10). In 1953, construction of 153 new bridges totaling to 24,800 feet of length was started, and in 1954, 130 more were added to this amount (10). The total length of the bridges built until 1956, beginning from 1950, is 150,900 feet (10). Two important additions to Turkish bridges are now under construction. One of these is across the Maritza River on the Greek frontier south of Edirne (15), which will considerably

shorten the distance between Istanbul and Salonika. The second project involves the spanning of the Euphrates River at Birecik east of Gaziantep (14). The completion of this bridge will shorten the distance to south-eastern Turkey and make possible the crossing of the river by heavy trucks at this point.

Improvement and maintenance of existing bridges continued all through these years beside the new constructions. The specifications for the dimensions and other matters of the bridge construction are studied continously and changed according to the new traffic conditions when justified.

C. Turkish Highways

Turkey's primary road system has two main routes which are also serving as international traffic arteries.

Route No. I (8), starting at the Bulgarian frontier and following the route Edirne-Istanbul-Izmit-Ankara-Aksaray-Adana-Antakya to Syria, links South East Europe and Turkey with Lebanon, Israel, Egypt and Africa, as far as Capetown. An agreement has also been signed by the governments of Turkey and Greece for the construction of a new highway, Istanbul-Tekirdag-Ipsala-Salonica-Athens, which is to connect southern and central Europe with the Middle East (Route No. 18) (8). It is anticipated that this highway will have an overall width of 33 feet (4).

The Directorate of Highways in Turkey has already started to work on it, together with the construction of a bridge over the Meritza river on the frontier between Turkey and Greece.

Besides Route No. I, there are two other major roads (8), which link Turkey with Syria. The first, circling Lake Amik, runs through the plains of Aleppo (Route No. 55) (8), and the second passes through the rich olive groves of Antep and Kilis (Route No. 59) (8). Route No. 69 (8) joins Diyarbaker to Syria and Irac via Mardin-Nusaybin. Route 75 (8) passes through Bitlis, Siirt and Cizre near the frontier, but it has been found necessary to construct a new road between Cizre and Siirt and this is scheduled to be built in the near future.

Route No. 2 (8) at present provides the main connecting link with Iran. It runs beyond the Trabson-Erzurum road (Route No. 40 and 65) to the frontier via Agri-Dogubayazit-Gurcublak (8). The construction of the highway, Diyarbaker-Van-Ozalp-Iran (Route No. 6) (8), which will form a second route between Iran and Turkey, has been agreed by the two countries, and this will be completed within the next few years and will form a part of the national network. When the international free port of Iskenderun materialized, Iskenderun-Kilis-Mardin-Hakkari-Iran route gained a great importance, for it eventually connects India and Pakistan with Turkey via

Iran and Iraq. (8)

The highway activities were concentrated recently on the Anatolian sectors of the London-Bagdad route (8) (Istanbul-Ankara-Syrian frontier) and on the so-called "Transit Route" (8) from Tabriz to Trabozan, the life-line of modern Iran[1]. These two roads, the first some 4,000 miles (8) long, the second 450 miles (8), carry more traffic than other roads, sometimes thousands of vehicles a day in both directions. Many drivers preferred the longer, but flatter and in part better surfaced Route No. 2 via Eskisehir to London-Bagdad route (8), until this road was properly surfaced in 1953. It was not until 1954 that the part of London-Bagdad route between Istanbul and Ankara came to be regarded as the main road, the distance being reduced from 312 miles to 292 miles (8), and remade and resurfaced over 40 per cent (8) of its whole length.

Since the work on the Istanbul-Ankara part of the London-Bagdad international route is nearing completion and the remaining southern sectors have been asphalted up to 70 per cent (8), other projects have been started. Among these is the rebuilding of the direct route through central Anatolia from Ankara to Erzurum via Sivas (8) (part of route No. 2), with its branch road to the Black Sea (Route No. 40). The stretch from Ankara to Sivas

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[1]Iran's only other direct link with the west is the railway which runs partly through Soviet Armenian Republic.

will be 63 miles (8) shorter than the old road. Another new project is the Turnpike from Istanbul to the Greek frontier, near Alexandropolis (Route No. 18), which will branch off from the existing asphalt road between Istanbul and Edirne, some 50 miles (8) outside Istanbul.

The other main routes of Turkish highways, besides Routes No. 1 and No. 2, are Route No. 6 and Route No. 20.

Route No. 6, beginning at Edirne in European Turkey, follows the Aegean sea shore to the south, then continues toward the east at the Mediterranian Sea shore, and meets Route No. 1 at Tarsus. After combining with Route No. 1 about 73 miles, Route No. 6 runs through the south-eastern Turkey as far as Hakkari.

Route No. 20 begins also at Edirne as a part of the London-Bagdad route, passes from Istanbul and leaving this international route at Adapazari, goes to the north to Black Sea shore and follows the shore as far as to the Russian border and to Kars. These two routes, Routes No. 6 and 20, connect most of the cities and towns which are built near or at the seashores of Turkey.

Routes No. 16, No. 35, No. 39, No. 45, No. 55, No. 57, No. 65, No. 83 and No. 75, connect Route No. 2 with Route No. 20 between Pazaryeri-Adapazari, Ankara-Songuldak, Ankara-Kastamoni-Inebolu, Yildizeli-Samsun, Sra-Ordu, Refahiye-Giresun, Erzincan-Traboson, Erzurum-Rize and Erzurum-Artvin respectively.

Routes No. 15, 25, 55, 69, 75 and No. 95 connect

Route No. 2 with Route No. 6 between Bandirma-Izmir, Bozoyuk-Antalya, Sivas-Fevzipasa, Zara-Duyarbakir, Erzurum-Baykan and Agri-Van respectively.

Route No. 1 and Route No. 6 are connected to each other by route No. 35, between Kulu and Silifke, passing from Konya, Turkey's largest province.

Turkish cities and towns are connected to each other by many more roads which connect the main routes to each other as their parts or continuations. Turkish highways with their complete details are shown on Map 4.

CHAPTER III

TRAFFIC STUDIES

The improvement of the Turkish highway system brought great changes into the character of the highway traffic. The connection of the residential areas with the districts of production by good roads and the resulting decrease in the transportation prices provided important economic development. But, at the same time, the big increase in the volume and speed of transportation caused a very serious traffic accident problem. Needs for an effective traffic law, control forces over traffic, and traffic engineering showed themselves and beginning from 1948, Ministry of Public Works, and after 1950, General Directorate of Highways began to work on these subjects.

This chapter presents these studies and their results.

A. Laws and Regulations of Highway Transportation

The preparation of Turkish Highway traffic law was begun in 1948 by the Ministry of Public Works. As the first step, the traffic laws of U.S.A. and some European countries were translated into Turkish and carefully studied (8). In 1950, the Ministry of Interior Affairs

and the Ministry of Communication joined in this work and a draft of the law was completed at the beginning of 1951. The bill passed the parliament on May 11th, 1953 (10) and was printed in the government's official paper on May 18th, 1953[1] (10). The Highway Traffic Law consisted of 10 parts: (4)

1. General rules, functions and qualifications.
2. Vehicle registration and licenses.
3. Road safety and traffic organizations.
4. Administrative licenses.
5. Traffic rules.
6. Traffic accidents.
7. Juristic responsibilities and insurance.
8. Penalties and fines.
9. Prosecution and judgement.
10. Miscellaneous rules.

The General Directorate of Highways in the Ministry of Public Works is responsible for the enactment of highway regulations and for setting up the methods of administration of the highways along the National Highway Network. Provincial governments and villages have administrative authority over the provincial and village road systems subject to directives and review by the General Directorate of Highways.

Traffic rules and regulations are also issued by the various Municipalities[2]. Each municipality makes its own regulations and fixes its own fees for the registration of vehicles and for the insurance of chauffeurs' and drivers' licenses.

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[1]Application of Laws begins on date that they are printed on the official newspaper.

[2]A Municipality is a provincial capital, a country capital or any place of over 2,000 population.

B. Registration, Licenses, Insurance and Taxes:

a. Registration and Licenses

After technical control, and if covered by an insurance policy against financial liability, a vehicle may be registered and a traffic license issued. Traffic licenses are valid in all parts of the country for one year from the date of issue. A temporary license and plate, valid for 30 days (4), is authorized under certain circumstances.

Driver licenses are of four types: (4)

1. Professional licenses.
2. Special licenses for persons using a heavy vehicles, such as a truck or bus.
3. Amateur licenses for the drivers of private cars not included in the first two categories.
4. International licenses which are issued in conformity with the procedure stipulated by international agreement.

Amateur licenses are valid in all parts of the country for a period of 3 years (4) from the date of issue, and professional and special licenses for a period of 2 (4) years. Requirements for driver licenses are a minimum age of 18 years for amateur or professional licenses, and 19 years for special licenses. Persons receiving a vehicular driver's license must be literate, have passed successfully theoretical and practical driving tests, have adequate health, have no addiction to the use of drugs

or alcoholic drinks and be free of any convictions under certain sections of the Turkish Penal Code (4).

Rates for registration, license and traffic fees are as follows in Turkish Liras: (14)

Registration:

Motorless vehicles	0.50 Liras
Motor vehicles	2.00 "

Traffic dues (annual):

Motor-less vehicles	1.00 "
Motor vehicles	20.00 "

Driver Licenses:

Amateur	1.00 "
Professional	2.00 "
Special	2.00 "

b. Insurance

All drivers operating in Turkey are required to carry insurance for financial liability against material and bodily injury. The minimum insurance required for various types of motor vehicles as measured by the financial liability for each accident is as follows in thousand of Liras: (14)

For bodily injury:

	Amount per accident
Motorcycles	2.0
Automobiles	55.0
Small trucks and vehicles with seating capacity of 10.	10.0
Tram cars and trolley busses	20.0
Motor busses with seating capacity of 25 or less	15.0
Motor busses with seating capacity of more than 25	20.0

For material injury:

Motor-cycles	1.0
All other vehicles	2.0

c. Taxes:

In Turkey cars are subject to taxation on yearly basis. There is no tax for trucks or comionettes. Taxes for cars are determined by the following factors:

1. Model
2. Weight
3. Brand

The taxes up to 1953 model cars are as follows (12):

Kilograms	Tax in Turkish Liras
951-1200	150
1201-1600	300
1601-1800	960
Above 1800	1800

There has been 30% increase on models from 1953 to 1956 and 50% increase on models 1957 to 1958. (12)

The license plate costs 20 Turkish Liras per year.

C. Control Forces and Agencies

The chief controls exercised over highway transportation are the requirement of a driver's license and vehicle registration and the application of the Highway Traffic Law. This law is enforced by the traffic police of the districts and provinces. Each province has a control and examination commission under the chairmanship of the provincial chief of security and a provincial commission on traffic, headed by the governor of the province.

In 1952, the "Bureau of Traffic Security" (10) was established under the General Directorate of Highway and another with the same name was formed under the General Directorate of Public Security. The functions of the General Highway Directorate Bureau of Traffic Security are:

1. To secure the duties of the General Directorate of Highways which are imposeted by the Highway Traffic Law.

2. To help General Directorate of Public Security on the applications of Traffic laws and regulations.

3. To analyze the traffic accidents and to make suggestions and give advice to the Highway construction and maintenance agencies, to city road administrators and to the General Directorate of Public Security. Also to analyze the technical applications of the traffic regulations.

4. To decide the standards of the traffic signs.

5. To study the traffic sign needs, to administer and control the manufacture of these signs.

6. To study the plans and projects of the government roads in the residential areas, to control them from the traffic security and operation points of view.

7. To prepare the publications for the traffic education.

The Bureau of Traffic Security under the General Directorate of Public Security established the Traffic Police on March 1952 (10), and the control of traffic became a separate subject under this new department.

Another control force on traffic are the engineers and the uniformed highway personnel of the General

Directorate of Highways. Although they don't have the authority of direct application of the traffic penalties, they may report the traffic violations to the Traffic Police.

D. Traffic Signs

With the decision of the United Nations Social Council, a group consisting of six specialists from different countries was assigned to the determination of the international traffic signs. The group held its first meeting in 1950 in New York (10) and reached decisions on some methods and conditions for the use of certain signs. After the results of the experimental applications of these decisions were studied during the first half of 1951 (10), the group held its second conference in Geneva on August 1951 (10). The Director of the Turkish Traffic Bureau represented the Middle East countries. In this conference, after the discussions of the results of the actual trials, some extensive results were obtained for the application of an international traffic signs system for the whole world. After the conferences with the delegations of the Ministry of Exterior Affairs and the Ministry of Public Works, these international traffic signs are accepted by the Turkish government on June 1953 (10).

The international traffic signs that are in use in Turkey are in three categories:

1. Danger signs which are square in shape and yellow and black in color.

2. Prohibition and Restriction signs which are circular and rectangular in shape and white and black and red in color.

3. Direction signs which are rectangular in shape and white and black in color.

On the plates, symbols are prefered to the written notices, for they are easier to notice from long distances. The traffic lights are green, amber and red, meaning go, slow down and wait, and stop respectively. White lines for the indication of center lines and yellow lines for the non-passing parts on the roads are used. Furthermore, the signs which are being used by the traffic police are standardized.

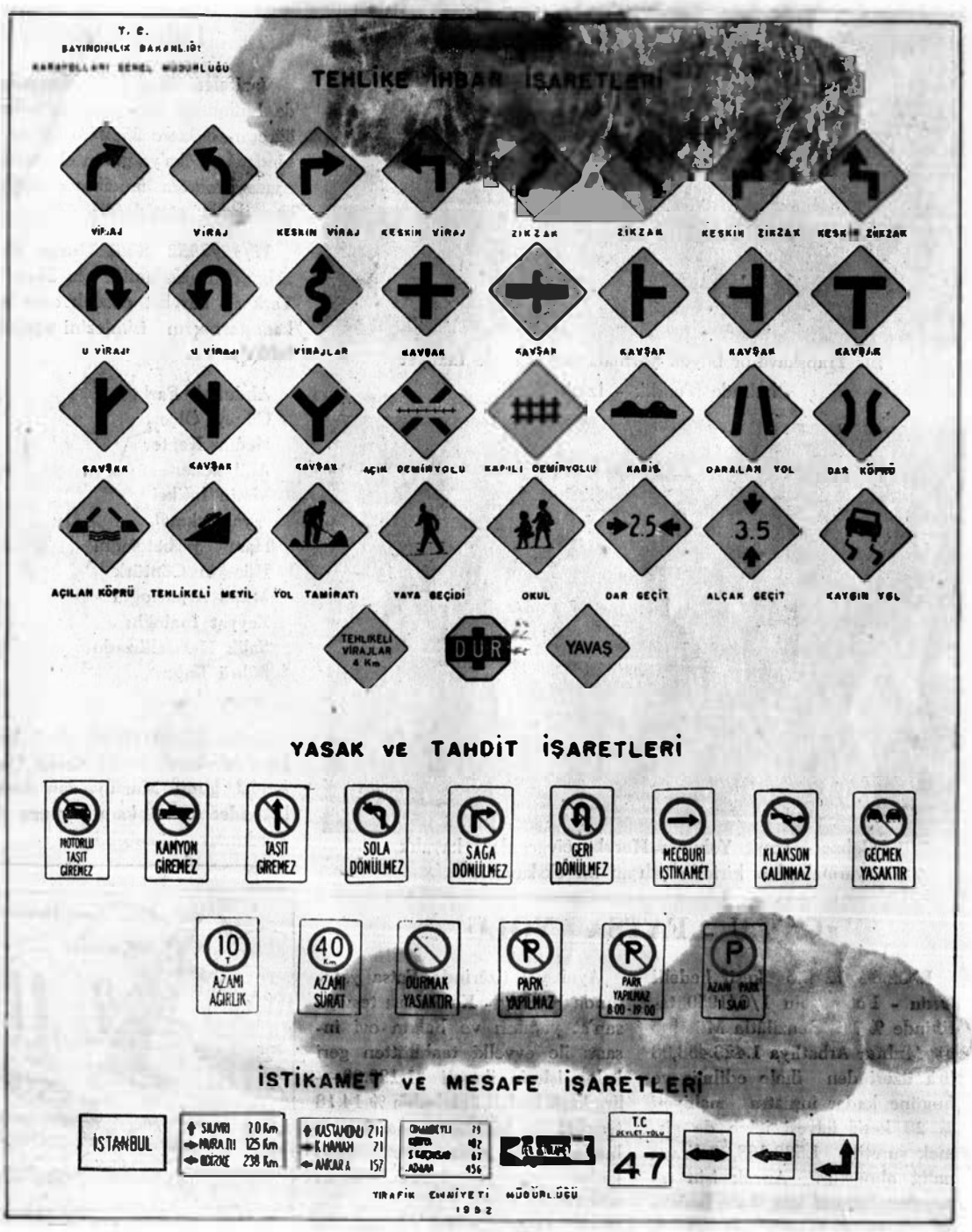
Traffic signs that are in use in Turkey are shown in figure 2.

E. Vehicle Studies

The number of vehicles in Turkey as of January 1, 1955, by make is shown in table 2 (14). These figures reflect a sharp increase over 1948, when registrations totaled 5838 automobiles and 10596 trucks. About half of the trucks in Turkey have a capacity of 5 tons (4) or more, and about a third of the buses have more than 30 seats (4). Roughly two-thirds of the automobiles and one third of the trucks are concentrated in the provinces of Istanbul, Ankara and Izmir.(4) Truck and bus services

Figure 2.

TRAFFIC SIGNS



are almost entirely privately operated, most of the firms engaged in these businesses being relatively small and having only a few vehicles. Another important highway passenger service is performed by the shared taxis which are available for hire between the major cities.

The number of vehicles through the selected years in Turkey are shown in Table 3 (4). As was mentioned before, the great percentage of vehicles is concentrated in the big cities. To make a comparison possible, the number of vehicles in Istanbul in 1956 is shown in table 4 (4).

F. Traffic Accident Studies

The Bureau of Statistics of the Turkish Highway Department had made a detailed study of the reported traffic accidents which occured before 1956 and found out that 256,376 vehicles (12) were involved in these accidents. The comparative percentage of accidents with respect to the vehicles involved is shown in table 5 (4). During 1956, 7,493 traffic accidents have been recorded in which 1237 persons were killed and 8673 were injured (4). The number of different kind of vehicles involved in accidents and the number of deaths caused by these vehicles in 1957 are shown in table 6, and table 7 respectively (4). Among the 1237 killed in 1957, 316 were killed in cities and the rest, 921, were killed on highways.

Table 2, Motor Vehicles in Turkey, as of January 1955

Origin	Auto-mobiles	Trucks	Buses	Total
Grand Total	28,599	30,250	6,671	65,520
United States, total	18,172	14,049	2,921	35,142
Chevrolet	2,928	3,134	1,124	7,186
Ford	2,170	3,698	754	6,622
Willys-Overland	4,189	1,034	194	5,417
Buick	1,107	-	-	1,107
Studebaker	378	477	64	919
Dodge	1,529	2,687	337	4,553
DeSoto	1,752	668	150	2,570
Plymouth	1,286	38	-	1,324
Other American cars	2,833	2,313	298	5,444
British, Total	4,450	9,697	1,610	15,757
Austin	1,032	6,147	1,433	8,612
Bedford-Vauxhall	528	1,326	100	1,954
Ford and Fordson	551	769	45	1,365
Commer and Hillman	520	529	32	1,065
Other British	1,819	926	-	2,745
German, Total	2,232	3,259	1,378	6,869
Opel	1,359	522	462	2,343
Mercedes-Benz	308	540	193	1041
Other German	565	2,197	723	3,485
Other European	2,040	2,024	306	3,370
Unclassified	1,705	1,221	456	3,382

Table 3 Increase in Number of Vehicles in Turkey

Year	Number of Vehicles
1934	7,540
1940	12,554
1947	15,913
1950	28,176
1955	65,520
1956	71,247

Table 4 Number of Vehicles in Istanbul, in 1956

Type of Vehicles	Number of Vehicles
Privately owned	
Private Automobiles	7,639
Taxi-cabs	6,166
Trucks	4,257
Camionettes	1,899
Buses	384
Official	
Automobiles	17
Trucks	737
Camionettes	1,105
Buses	361
Motorcycles	96
Total	22,661

The major cause of the traffic accidents in Turkey is speeding. The number of accidents caused other than speeding are as follows in their order of importance (12):

1.	Violation of traffic rules	1,805
2.	Lack of driving knowledge	348
3.	Transportation of passenger on trucks	149
4.	Drunk drivers	144
5.	Reckless driving	136
6.	Non-observation of traffic signals	107
7.	Sleepy drivers	57

In last ten years, most of the accidents in cities were caused by persons whose age was around 25 (10). The accidents that occured outside the city limits were mostly caused by drivers below 20 years of age. 42.8 per cent of the pedestrians involved in accidents were below the age of 15. 42 per cent of the accidents happened to children and 29 per cent of these ended with death (10). Children who have accidents are mostly in their fourth or fifth year. Also the number of traffic accident victims over 60 years of age is high. On the other hand, persons between the ages of 25 and 50 and especially women have comparatively few accidents (10).

Statistics show that, in Turkey, a great percentage of city traffic accidents occur in May, on Fridays and Sundays and between 4 p.m. and 6 p.m. (12). On the other hand, highway accidents occur mostly in December around 4 p.m., and they are distributed almost equally

among the days of the week (12). Also, it is noted that a great percentage of these accidents are caused by trucks.

The number of persons killed and injured in traffic accidents during the past years are shown in table 8 (4). As can be seen from this table, the accident rate increased almost 100 per cent between the years of 1949 and 1955.

Table 5, The Comparative Percentage of Accidents with respect to the Vehicles involved until 1956

Vehicle Type	Per cent Accident
Trucks	35.2
Cars	28.9
Buses	10.8
Tractors	6.6
Motorcycles	4.9
Animal drawn vehicles	4.4
Bicycles	3.5
Others	5.7
Total	100,0

Table 6 Number of Vehicles involved in Accidents in 1957

Vehicle Type	Number of Accidents
Cars	3,215
Buses	2,035
Trucks	1,416
Tractors	609
Motorcycles	404
Animal Drawn Vehicles	296
Bicycles	381
Total	8,155

Table 7 Number of Traffic Accident Deaths in 1957

Type of Vehicle	Number of Deaths
Trucks	655
Buses	155
Cars	144
Tractors	143
Camionettes	68
Animal Drawn Vehicles	38
Motorcycles	26
Bicycles	8
Total	1,237

Table 8 Number of Traffic Accident Deaths and Injuries in past several years

Years	Death	Injuries
1949	696	4314
1950	748	5298
1951	940	7004
1952	1283	9108
1954	1303	9171
1955	1274	9595
1957	1237	No record

CHAPTER IV

DISCUSSIONS AND RECOMMENDATIONS

Every possible advance in Turkey, whether for the development of agriculture and industry or for the improvement of health, education and other social and political welfare, depends on transportation. Yet no part of Turkey's development was more backward than that of her railroads and roads until very recently. As M. W. Thornburg has written in one of his articles[1]:

> "Within the political bounderies of Turkey are a hundred 'little Turkeys', each economically isolated from the rest and usually producing only a fractional part (one-third to one-tenth) of its potential. Obviously the strength of Turkey cannot approach the sum of its parts until they can beadded together. Until this be done no surplus will be produced as an increment to the national wealth, no local industries based upon such surplus will be possible, no purchasing power will be created to enable expanded and diversified consumption, and no substantial improvement in the standard of living can be expected."

Turkey made great efforts for the improvement of her road systems since the above article was written. Time was short, and the job was one which needed good organization, huge expenditures and willing and skillful workers. Turkey, although lacking in many of these needs,

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[1] M. W. Thornburg, "Turkey's Aid for What," Fortune, October 1947.

made great progress on her road system and also made some mistakes which in one way or another had an effect on her economic life and development.

A. Why Turkey Had No Highway System Until a Few Years Ago

If anyone should look at a map of Turkey, dated, for example, 1945, in order to see a picture of her road system, he would find a few lines which appear to have no order or design. A highway map of a highly productive country shows a network with trunk or main lines and branches. There are customarily direct connections between important cities and between ports and the interior. Judged by such expectations Turkey had, properly speaking, no highway system at all at that date.

There were geographical, military, administrative, economical and political reasons for this situation:

1. Lack of Organization:
   Until 1860, Turkey had no highway organization of any kind, "The General Directorate of Roads and Communications" which was established in 1860, was the first governmental organization that had something to do with roads; but not as an independent road organization. This directorate existed, without any planned long-term road activity, until Turkey declared herself a republic in 1923. Between 1923 and 1929 road administration was under the jurisdiction of the Ministry of Public Works, without any separate organization or administrative body. In 1929, a law was passed whereby a "Department of Roads and Bridges" was established within the Ministry of Public Works. At last in 1950, "General Directorate of Highways" was created as a semi-autonomous government organization

after studies of modern highway organizations of many countries and their possible adaptions to the conditions of Turkey had been made.

2. Lack of Planning:

The transportation facilities of Turkey were never planned and conceived as a system serving the improved agriculture, the industries or the mines which were set out to develop, especially after the Republic.

3. Lack of Revenues:

Road construction on a financially sound basis in Turkey did not materialize before the introduction of the "road tax" in 1929. Due to the economic difficulties of those years the road tax, collected for highway and bridge construction, was spent on expenditures other than road work. This situation continued until 1950, when the new highway law came into effect and provided the Directorate of Highways with steady and sure sources of income.

4. Effect of Geography:

Three fourths of the perimeter of Turkey is sea coasts, and on the rich coastal plains to the west or south most of Turkey's economic activity in the past has originated and most of the population has lived. The main export crops grow here and the ancient trading ports are here. Commerce and travel were largely by sea near the coast or to neighboring islands. The sparsely settled and rugged interior used to be regarded as a region to be travelled only on the rare occasions when there was need to do so.

5. Effect of Military Purposes:

The Turks, in deciding where roads should go or should not go, were under the rule of men with military traditions who thought of them as routes for armies rather than for trade. The military mind has been slow to appreciate the fact that there is a broader strategic concern with transportation that is the building of an

economically powerful nation capable of defending itself by virtue of its high productivity.

6. Politics in Highway Construction:

Most of the highways which were built before the Republic were outside Turkey's heartland, Anatolia. Roads were built in Arabian countries to the holy cities to keep the Arabs happy under Turkish rule. Again, roads and excellent bridges, which are still in use, were built in today's Yugoslavia, Greece, Bulgaria, Romania to prove that Turkey has great interest in those countries. These expenditures were taking a great percentage of the allocations specified for road construction.

7. Effect of Wars:

Frequent wars were one of the most effective factor that caused the lack of a highway system in Turkey. After the Turkish government took forward a step toward the construction of roads in 1860, two Russian wars, war with Italy in 1911, the Balkan war in 1912, the First World War in 1914, then the Independence War between 1919 and 1923, gave no opportunity to further a highway program. For example, in 1908, the construction of certain major roads was entrusted to a French firm; but, because of the Balkan War and then the First World War, work was discontinued.

B. Highways Versus Railways in Republic Era

At the beginning of the Republic regime in 1923, inland transportation was being done by horse-drawn and ox-drawn carts and primitive buggies. It was evident that there was no possibility to build asphalt roads for ox-carts. The government was, therefore, forced to develop vehicles as well as traffic arteries. During the Second World War the mass transportation of army divisions caused railroads to become the most important

means of transportation. Therefore, their construction was emphasized. Statesmen were then so impressed with the importance of railroads that they did not realize that the country would also need highways. Because of this, Turkey even after 25 years from the declaration of Republic was behind the neighboring countries in respect to comparison of highways per kilometer square of land.

After World War II, the volume of traffic increased so rapidly that the highway problem presented itself very clearly and the slogan "to interlace the country with railroad networks" began to have less significance. Therefore, along with the railway a program for a highway of 14400 miles was planned in 1948, and the work began immediately. In the 1950 election, the opposition party came to power with a strong highway policy. The budget of the Directorate of Highways which was 19 million dollars in 1950, increased to 134 million dollars in 1957. In 1958, 177 million dollars out of a 282 million dollars budget of the Ministry of Public Works will be used for highway work. Unfortunately this highway policy caused the railway construction to slow down after 1950, even almost to stop, we might say, during the last two years. The railroad construction program of 1947, which was intended for about 1400 miles of completely new railway construction in 15 years, was cancelled in favor of the

highway construction. Today the only railway construction is between Genc and Tug on Lake Van shore. Although it is only about 100 miles in length, the work on this railway route has been in progress since 1951.

In the justification of this situation, it is said that with the new highway system, the commercial transportation will be made by highways and the importance of railways is lessened. If the volume of transportation of commercial goods by railroads is inspected, it will be seen that the amount of 2,722,851,533 ton-kilometers in 1948, has increased to 4,366,000,000 ton-kilometers in 1955 (10). Another point used in the justification of the reduction of railway construction is the comparison of the railway-highway length ratio with other countries. It is said that in the countries which have the most advanced position in transportation systems, the ratio of the total length of railways to the total length of roads is 1 to 10-20 miles. If this ratio is applied to Turkish transportation systems of 4400 miles of railways, a road system of 66,000 miles is required to have a ratio of 1 to 15. Since Turkey has only 34,000 miles of roads today, the length of roads should be doubled to reach the proper ratio. This is a very wrong conclusion. The countries that have this ratio are the ones whose

railway systems are complete and modern. Therefore the ratio can be applied to Turkey's transportation systems only after the railway system is adequate, at least to a certain degree, for the needs of the country.

It is a great mistake to consider only one or two transportation facilities in programming the transportation system of a country. Highways, railways, airlines and sea transportation should be taken into consideration together in order to establish an ideal and steady transportation system. Instead of taking the railway and highway problems one at a time, these two should be planned together within wisely constructed programs.

C. How Perfect is the New Highway Organization?

The General Directorate of Highways is one of the most skillfully planned organizations in Turkey. The reasons for this quality can be summarized in three points:

1. In the planning of the organization, the Highway Department organizations of many countries, with long experiences in building and revising their organizations many times until they made them perfect, were carefully studied and the best points applicable to the conditions of Turkey were used.

2. Turkey profited from past mistakes made in organizing highway departments.

3. The U.S. highway organization know-how which had every opportunity in finding how to develop a good organization in recent decades, was helping to organize the departments.

In spite of all these advantages, some small and some more important mistakes couldn't be avoided in the organization of the new Directorate. These are discussed in the next paragraphs:

1. Although the Highway Directorate is a semi-autonomous government organization within the Ministry of Public Works, it is not free from the rigid rules of financial control. The Chief Accountant and the personnel of his department in the Central organization are appointed by the Ministry of Finance, and they control all the expenditures of the Highway Directorate. The spending of the budget of the Directorate should be justified by the Ministry of Public Works, or even by the Directorate itself.

2. A good highway organization should be able to adapt itself to new or changing conditions easily and quickly. To provide this elasticity, some changes should be made in the Highway Organization Law. Today's law requires long formalities even for matters of the slightest importance. Also, more power should be given to the General Directorate of Highways and to his assistant.

3. Some divisions in the Central organization are under the jurisdiction of the wrong departments and some of them should be independent departments rather than divisions. After the Directorate was established in 1950, some of these mistakes were noticed and corrected. But, there are still more to correct. For example the division of "Traffic and Operations" should be an independent department rather than being a branch of the "Department of Technical and Economic Research." It works together with the General Directorate of Public Security, therefore, a part of its functions is connected to an outside organization which has no relation with the Department of Technical and Economic Research of the Highway Directorate.

   The conditions of the "Division of Equipment" which is a branch of the "Department of Construction

and Maintenance" is the same. Providing the necessary equipment for a highway job should be done easily and quickly. Under present conditions, even a small purchase of the division has to be approved by so many department heads and so many formalities have to be completed that highway works are delayed very often.

4. The size of the 12 field divisions are so big that the control of the work by the division head and his seven assistants can't be accomplished properly. Each division is responsible for 5-10 provinces. In addition to these, in most of the cases, division organizations actually take care of the highway works of the counties, too. This is because, although highway law requires every one of the 450 counties to have a highway engineer and a small organization, presently very few counties can provide these and apparently the situation will not change for many more years because of the lack of highway personnel and revenues. The number of divisions which was 10 in 1950, has increased to 12. But, divisions should still be divided into more sections in order to be able to perform good quality highway work.

D. Highway Organizations Finance

There is a great difference between the General Directorate of Highways and Province and Village highway organizations in regard to their financial positions. This difference, which is in the favor of the General Directorate, is caused mostly by the unbalanced direct appropriations of the government for various highway systems rather than the differences in the sources of revenue.

Because of the strong highway policy of the government, no financial difficulties exist for the

Directorate of Highways at the present time. In addition to the custom duties and other taxes levied on various petroleum products, 15 per cent of the road tax, and revenue collected from the rent and sale of discarded equipment, material etc., great amounts of direct appropriations from the national budget form the budget of the Directorate of Highways. Another source of revenue for the Directorate is the American aid for the primary system, which amounted to 40.3 million dollars since 1948. The budget of the Directorate increased continuously year after year. Its 1958, 177 million dollars budget is 62.5 per cent of the budget of the Ministry of Public Works and 10.8 per cent of the whole budget of the Turkish government. Also, a part of the supplementary budget, which is 388 million dollars, will be spent for highways in 1958. As it can be concluded from these figures, the Highway budget of Turkey is at its maximum level within the possibilities of Turkish government's income.

The budgets of the province and village roads are in just the opposite condition. The only fixed income of these departments is 85 per cent of the road tax which is a very inadequate source. Although needs of these roads systems are studied and plans and programs for their construction are prepared, because of the large expenditures

on the primary system, nothing much could be done for them up to now. More direct financial support from the budget of the Ministry of Public Works must be provided to provinces and villages for their road needs, instead of, or in addition to, the equipment, materials and personnel help through the General Directorate of Highways.

Use of parking meters, which is not applied anywhere in Turkey yet, can be a good source of income in large cities. These revenues may be used for the city roads or, in case of need, for off-street parking facilities.

A part in the present law for financing highway projects causes delays and difficulties in highway works. According to this law, at the end of each fiscal year, allocations for the unfinished parts of the projects are cancelled and, after repeating the necessary formalities, new ones are provided. It is obvious that it is not possible to complete big projects in a single year. Therefore, these cancellation-granting formalities take place in large numbers every year. To save time and money, this law must be revised, and after cost estimations for planned projects, necessary amounts must be provided in advance.

In some cases, especially between 1950 and 1953, after cancellation of allocations, new ones haven't been granted

and some projects have waited for long periods to start again.

E. Highway Personnel Problems

The shortage of technical personnel in Turkey has been a continual problem in the administration of highway projects for the past several years. This situation, while serious now, is one of the major problems in organizing and carrying forward the highway construction program of such magnitude proposed by the government as the national highway program. The very first reason for the shortage of engineers is the lack of enough engineering schools in Turkey. Almost all of the engineering schools have entrance examinations, and even if all of the applicants are very successfull in their examinations, only 20-45 per cent of them can be accepted, because of the limited facilities. Those who can't succeed to enter, either try to study in another country or choose another profession. The highest percentage of enrollment among the engineering students is in the civil engineering field in Turkey. But, after graduation a very small percentage of civil engineers prefer the highway field. The reason for this can be summarized in three points:

1. Salaries offered by highway departments are low.

2. Since they usually pay more than governmental departments, engineering graduates prefer to work in private companies. But, most of the private contractor firms work on other fields rather than highways.

3. Working and living conditions on highway jobs are not good in Turkey.

The only point in favor of the highway field is that the Directorate of Highways has long term highway programs which secure the jobs of the highway personnel. The good retirement system which exists in all governmental organizations may be stated as another advantage only over the jobs in private companies. In attracting the engineers to the highway field, the most effective way, for the conditions of Turkey, is to finance many engineering students during their studies. Especially those who are unable to enter the engineering schools and have to change their field of study may be sent to other countries for study by the Directorate. Also, the salaries and wages of engineers and especially technicians and operators must be increased.

The effects of the shortage of engineers may be decreased by using the work hours of the present personnel advantageously. To follow short methods and to apply modern engineering practices may save a great amount of engineer-work-hours. Also, some changes in the specifications may be helpful. For example: more than necessary control on every kind of work is required by the present

specifications. In concreting, a continuous control of every phase, which needs the full time work of an engineer, is required. Instead of this continuous control, a determination of the properties of concrete, after the concreting is complete, may be enough, if the other personnel on job are experienced. Although they are much more costly, the application of the modern methods on various kinds of work, such as the use of photogrammetry, helps to save a lot of engineer-hours. To standardize the forms of reports and data sheets may also help to save time. In office work, modern equipment for every kind of work must be provided.

The results of the personnel training methods[1], which are used by the Directorate of Highways, are very satisfactory. Therefore, the short courses must be increased in number and must be extended to all kinds of highway work. Also, in addition to sending engineers to other countries for training, specialists in various highway works may be invited to Turkey to train highway personnel. This is accomplished to a degree by the presence of the American Highway mission in Turkey.

Formation of a professional highway engineering society and interchange of ideas and publications with

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[1]Refer to Chapter I

corresponding organizations of the other countries would increase the knowledge of the personnel about the developments in their fields.

F. Discussions On the New Highway Programs

Before expanding its organization, the Turkish General Directorate of Highways made a careful study of all existing conditions. At the conclusion of this study an efficient highway program was established.

In the next paragraphs some phases of this program and also methods of programming are discussed.

1. Classification of the Roads

Turkish highways and roads consist of three systems: - Primary System; Secondary System, which also contains province roads; and the Village Roads System.

The principles of the Turkish primary highways were established in 1946, in an inter-ministry road conference which decided a program based on five major considerations:

a. What road communication should be established with neighboring countries?

b. What are the centers of population and agricultural production which shouldbe interconnected?

c. What roads will be required to feed the railways?

d. What roads will be required for exploitation of mineral resources?

e. What roads will be needed for manufacturing developments?

These five points remain as the basis of the primary

system. In 1951, the secondary and village road systems were established, and programs were drawn up on these five and other considerations for the new systems.

As a basis this classification is satisfactory, even perfect for Turkish roads and highways. But, in detailed highway planning, especially for improvement of the existing roads, it is very general. A second classification based upon the possible functions of the roads should be done. This classification should be simple and should indicate three factors, namely, character of traffic, traffic density and the accepted project speed. Since these three are the basic factors effecting the road projects in the designation of the classification, only these three should be shown to prevent confusion. The classification will be a great help in making programs for the improvement of the roads. For example; a continuous increase in traffic density of a road or an unsuitable speed limit for a certain density can be easily noticed with this system.

2. Requisities of Planning.

One of the first tasks in developing a new program must be to establish criteria for guidance of those who make studies of particular projects, and for determination of priorities. These studies must take into

consideration the type of road needed for each purpose in view. They must have regard for conditions of soil, climate, available material and service of the road. They must see the road system as part of the whole network including other means of transportation. Departments, which are responsible in planning and in the determination of prorities, should be very careful to serve real and existing needs rather than doing the more spectacular jobs first. The highway between Ankara and Istanbul, built to latest standards, may not for years carry enough traffic to pay for its construction, but, a simple all-weather road, adequately maintained, between a fruit growing area and a preserving and shipping point may return in one season more foreign exchange than would be needed to pay the whole cost of the road and the vehicles which used it.

3. Preparation of Programs

The short and long term highway programs are prepared by the "Department of Technical and Economic Research" of the Highway Directorate, after careful inventory, traffic, economic and financial studies. The results of these studies are analyzed as a whole and upon this analysis the necessary roads are taken into highway programs.

On long term programs, the changing needs and other conditions should be followed carefully and

necessary changes in program should be made.

4. Development in Secondary System

In the Highway Law, secondary system roads are described as the roads which connect the cities and the towns to each other, to communication centers such as railway stations, ports and airports, andto the primary system roads.

Unfortunately, with the exception of the construction and improvement of some 4800 miles of roads by means of the direct appropriations from government budget, nothing much is done by the provinces for the secondary system. This failure is due to the lack of programs in the first place, and then due to the lack of revenues and personnel. The limited highway funds of the provinces are spent on the construction of pieces of roads here and there, and no maintenance is provided for them afterwards. In the last few years, it was decided that the three-year highway programs of the provinces would be studied and approved, and their applications would be controlled by the General Directorate of Highways. These measures help the secondary system only to a certain degree.

In order to secure good results, highway administration of the provinces should follow the principles listed below:

a. Provinces should appropriate more funds for highway work from their budgets.

b. The selection of roads for construction should be on the basis of their economic, social and administrative importance.

c. The work should be concentrated on one or two projects, according to the available funds and the factors stated in item 2.

d. Upon completion, maintenance of roads should be secured.

5. Negligence of Eastern Turkey is Partly Recovered

It is a fact that the negligence of road construction was not at the same level in every part of Turkey. There has been always a great difference between Eastern, and Middle and Western provinces. Every opportunity is used in the new highway program to fill this gap. In order to take better care of eastern provinces, two more field divisions are added to the present three divisions of the eastern Anatolia. Today, the road needs of this part of the country are provided as far as the primary road system is concerned. But, there is a long way to go for solving the road problems of provinces and villages. From now on, more attention should be paid to these systems, rather than working on the primary system.

6. What is the Most Suitable Length for the Primary Roads System?

The section No. 5539 (10) of the Highway Law states that Primary system roads are those which connect the principal cities, railroad centers, ports and major airports to each other. Authority is given to the General Directorate of Highways for selecting the roads

to be included in the Primary system. In 1951, during the general planning of the highway systems, 12500 miles of roads were selected to form the Primary System. On the completion of these roads, production, trading and shipping centers of the country will be connected to each other satisfactorily. New roads which may be added to this length will be of secondary importance as far as the purposes stated in the law are concerned. Moreover, this will cause new spending which may be used for the improvement of the standards of the present Primary System and for the Secondary and Village Roads Systems.

In the U.S. highway law, it is required that the length of the primary system roads will not exceed 7 per cent of the total length of roads. On the present program of Turkey's three systems, primary system roads make up 10 per cent of the total. Although the United States' 7 per cent formula cannot be accepted as an ideal solution for every country, it helps to see that our present program for primary system is enough for the country's needs.

7. Tourism and Road Programs

Turkey, with her many historical and scenic places, is an ideal vacation land for tourists. Because of the lack of good roads, tourists coming to Turkey, until

eight or nine years ago, had been obliged to visit only a few places. Development and progress in highways have made possible an appreciation of the touristic spots in the country. In planning Turkey's highway network, necessary emphasis was given to tourism and to development of such facilities, and it was planned to exploit four regions. The first region covers Istanbul, the Bosphorus, the Sea of Marmara, the Dardanelles and their vicinity; the second is the Aegean sea region, including Izmir, Troy, Bergama and Efes; the third is the Mediterranean coast line; and the fourth is Central Anatolia, including Ankara, Kayseri, Urgup and Konya, the eleventh century Turkish capital. The construction and improvement of branch roads leading to cities of historic interest, as well as to the lakes, forests, skiing, hunting and fishing resorts, was also planned. Works on certain of these roads have been completed within the last few years. When the programs are fully completed and small inexpensive hotels and restaurants are in existence, Turkey will undoubtedly attract a great number of European and American tourists. General Directorate of Highways and General Directorate of Press, Broadcasting and Tourism, should cooperate closely on this work.

8. Acquisition of Land for Future Highway Use

One of the subjects, given top priority, especially

in view of Turkey's large highway program, should be acquisition of land for future highway construction and improvement. Advance acquisition of right-of-way is desirable for several reasons:

a. Right-of-way costs will be minimized by forestalling the development of the land ultimately required for highway purposes.

b. The orderly development of communities will be facilitated.

c. Private property owners will be able to plan their private land uses and development consistent with the ultimate highway plan.

9. Politics

Politics which had caused many changes in the location of various projects in Turkey, fortunately, had almost no influence on the determination of the routes of the Turkish highway system. This is one of the reasons for Turkey's good primary highway program.

G. Traffic Accidents Problem

According to the statistics, Turkey ranks second in Europe in the number of traffic accidents. To solve this serious problem, four very important factors should be provided in Turkey:

1. Traffic Law
2. Traffic Police
3. Traffic Engineering
4. Traffic Training

Together with the new highway programs, extreme attention is given to these factors, and they are

provided for partially or completely.

The traffic law bill, having all the necessary rules for a safe and orderly traffic, passed the parliament in March 1953. Before this, in May 1952, the traffic police organization was established under the administration of the General Directorate of Public Security. The next step on this subject should be the establishment of a highway police organization within the Directorate of Highways.

Traffic engineering in Turkey is present only within the limits of the General Directorate of Highways with its "Division of Traffic and Operations." This division performs the requirements of traffic engineering for the primary highway system of Turkey. In the Secondary and the village roads systems, rather than performing traffic engineering studies on each project individually, the general requirements of traffic engineering are applied.

The only activity performed on the traffic training subject is the distributions of a few booklets about the traffic accidents, signs etc. That, compared to the size of job to be done, is nothing. Traffic training should begin in the school, and continue with publications, movies, speeches and radio programs, to make every single person learn the rules of traffic safety.

H. Effects of the Highway Development on Turkish Economy and Social Life

Road net-works are closely related to the economic and social well-being and vitality of every nation. They are also a must for the countries' national security. Cultural relations between communities and tourism depend on the highways before everything else.

Highway development of Turkey, although it is in the first stage, already has provided great progress in the economic and social life of Turkey. This progress may be summarized in the results listed below:

1. Increase in Production.
2. Extension of the present industries and establishment of new ones.
3. New residential areas.
4. Improvement in living standards.
5. Increase in capabilities to buy and in consumption.
6. Permanent and temporary labor for industrial centers.
7. Increase in the relations between cities and villages.
8. Increase in educational opportunities.
9. Improvement in health standards.
10. Improvement in transportation facilities and standards.

Although it is not possible to evaluate most of these profits in term of numbers, some figures may be given to show the effects of the highway development.

The transportation fee for goods which was 9 cents per ton-kilometer in 1948 was reduced to 6 cents per ton-kilometer in 1954 (10). Average savings per year due to this 33 per cent decrease are 32 million dollars (10).

Transport tion of goods by highways reached to 2,186,584,000 ton-kilometers in 1955 with an increase of 490 per cent over the 370,475,000 ton-kilometers transportation of 1948 (10). During the same period passenger transportation increased 713 per cent, reaching to 9,846,228,000 passenger-kilometers (10).

Average yearly savings in vehicle expenditures due to the highway development are as follows (10):

From tires 6.7 million dollars, from gasoline 24.8 million dollars, from accidental damages 3.2 million dollars, from repair costs 8.2 million dollars. Time saving is calculated to a worth of about 30 million dollars in 1955.

The 89 per cent increase in the cultivated land and 53 per cent increase in agricultural production are proved to be mostly due to the highway development in Turkey (10).

During the past seven years, then, national saving effected by the improvement in the highway system has been computed as twice the amount of funds invested for improvement. This is another indication that the funds spent for such work have been economically sound investments.

CONCLUSION

On the whole, the Turkish road program has been another successful achievement toward making a better and happier Turkey. However, in spite of concentrated efforts currently made, a great deal yet remains to be done in phases related with national economy, town planning, road administration and traffic regulation.

LITERATURE CITED

(1) American Association of State Highway Officials, Road User Benefit Analyses for Highway Improvements, Washington D.C., January 1955

(2) American Society of Civil Engineers, Civil Engineering, Volumes 17-29, 1947-1957.

(3) Bruce and Clarkeson, Highway Design and Construction, 3rd Edition, Internation Textbook company, 1950.

(4) Daye, M. Traffic Engineering in Turkey, University of Michigan, August 1957.

(5) Engineering News-Record, McGraw-Hill Publishing Company, New York, Volumes 139-158, 1947-1956.

(6) Highway Research Board: National Academy of Science - National Research Council. Better Laws for Better Highways. Bulletin 88, Publication 316, Washington D.C. 1954.

——— Economic Impact of Highway Improvement, Special report 28, Publication 541, Washington D.C., 1957

——— Highway Laws, Bulletin 145, Publication 437, Washington D.C., 1957

——— Highway Needs Studies: 1957, Bulletin 158, Publication 497, Washington D.C. 1957

——— Highway Planning. Bulletin 17, Washington D.C., 1948

——— Highway Planning and Urban Development, Bulletin 64, Publication 249. Washington D.C, 1952

——— Highway Research Organizations, Bulletin 15, Publication 284, Washington D.C., 1953.

——— Highway Sufficiency Ratings, Bulletin 53, Publication 228, Washington D.C. 1952

——— Highway user Taxation. Bulletin 92, Publication 340, Washington D.C., 1954

———— Intergovernmental Relationships in Highway Affairs. Bulletin 66, Publication 255, Washington D.C., 1953.

———— Manpower Needs in Highway Engineering. Bulletin 106, Publication 357, Washington D.C., 1955.

———— State Highway Organization Charts. Bulletin 20, Publication 352, Washington D.C., 1954.

———— Some Economic Effects of Highway Improvement. Bulletin 67, Publication 256, Washington D.C., 1953.

———— Traffic Accident Studies Bulletin 74, Publication 265, Washington D.C., 1953.

———— Training Highway Department Personnel Bulletin 103, Publication 351, Washington D.C., 1955.

———— Use of Parking Meter Revenues. Bulletin 33, Washington D.C., 1951.

———— Utilization of Highway Engineering Manpower. Bulletin 134, Publication 424, Washington D.C., 1956.

(7) Ritter and Paquette, Highway Engineering, The Ronald Press Company, New York, 1951.

(8) Road International Magazine. Highway Development in Turkey. Vecdi Diker, Winter, 1951.

———— Better Roads for Balkans. Ernst Wiese, Autumn 1955.

(9) Thornburg, Spry, Soule. Turkey: An Economic Appraisal; Twentieth Century Fund, Inc. New York, 1949.

(10) Turkish General Directorate of Highways. Bulletin of Highways No. 1-36, November 1950-October 1953; No. 52-53, February 1955-March 1955; No. 55, May 1955; No. 60-61, October 1955-November 1955; No. 68-76, June 1956-February 1957.

———— Turkey Highway Map 1957.

(11) Turkish Information Office, Turkish Roads and Highways. New York, 1955.

(12) Turkish Touring and Automobile Society. Official Bulletin, No. 184-185, May 1957-June 1957, Istanbul.

(13) United States Bureau of Public Roads, Proceedings, Volume, 27-37, 1947-1956.

(14) United States Department of Commerce, Investment In Turkey. Washington D.C., July 1956.

(15) World Highways Magazine. Turkey Road Budget Set at $134 Million, April 1, 1957.

BULGARIA
GREECE
Edirne
Kirklareli
Tekirdag
ISTANBUL
①
SEA OF MARMARA
Izmit
Canakkale
Bursa
Bilecik
Balikesir
Kutahya
Eskisehir
ANKARA
④
Manisa
②
IZMIR
Afyon
Aydin
Denizli
Burdur
Isparta
Mugla
Antalya
③
KONYA
Lake Tuz
Kirsehir
Nigde
⑥
KAYSERI
MERSIN
⑤
Adana
Antakya
Zonguldak
Kastamonu
Bolu
Cankiri
Corum
Sinop
⑦
SAMSUN
Tokat
Yozgat
Sivas
Ordu
Giresun
TRABZON
⑩
Rize
Artvin
Gumusahe
Erzincan
Hozat
Bingol
⑧
ELAZIG
Malatya
Maras
Gaziantep
Urfa
DIVARBAKIR
⑨
Siirt
Mardin
Kars
⑫
ERZURUM
Karakose
Mus
Lake Van
VAN
⑪
Colemerik
BLACK SEA
U.S.S.R.
IRAN
IRAQ
SYRIA
MEDITERRANEAN SEA
CYPRUS

HIGHWAY FIELD DIVISIONS

International Boundry
Province Boundry
Division Headquarter
④ Division No.

0 50 100 150 Miles
0 50 100 150 Kilometers

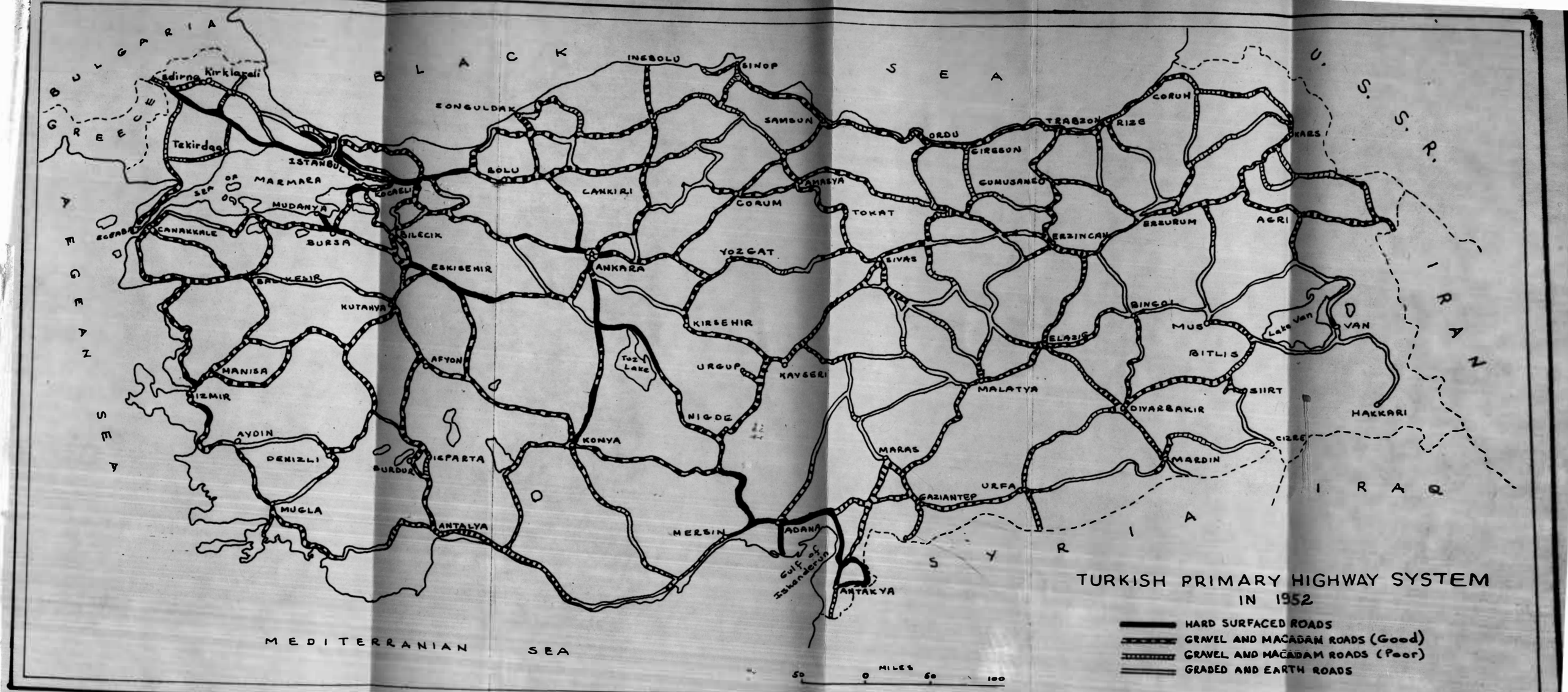
Map 1.

Map 2.

ROADS TO BE CLEARED OF SNOW

——— Continuous Snow Removal

- - - - - - Occaisonal Snow Removal



TURKISH PRIMARY HIGHWAY SYSTEM
IN 1952

- HARD SURFACED ROADS
- GRAVEL AND MACADAM ROADS (Good)
- GRAVEL AND MACADAM ROADS (Poor)
- GRADED AND EARTH ROADS

Map 3.


TURKEY
HIGHWAY MAP
Hard Surfaced Roads
Loose Surfaced Roads
Loose Surfaced Roads
Graded or Unimproved
Scale: 1:2.000.000
BLACK
SEA
U. S. S. R.
SEA OF MARMARA
MEDITERRANEAN
SEA
SYRIA
IRAQ
CYPRUS (Br.)
ISTANBUL
ANKARA
IZMIR
KONYA
ADANA
ERZURUM
SIVAS
KAYSERI
MALATYA
ANTALYA
VAN